REMARKS

Claims 66, 67, and 88-90 (of which claims 88 and 89 were withdrawn from consideration) were pending in the patent application at the time the final Office Action was mailed. By this Amendment, claims 66, 67 and 90 have been amended and claims 91-109 have been added, of which claims 91 and 104 are independent.

In the Office Action, claims 66, 67 and 90 were rejected under 35 U.S.C. § 112, first paragraph. The claims were additionally rejected under 35 U.S.C. § 102(e) as being allegedly anticipated by U.S. Patent No. 6,584,907 to Boucher or under 35 U.S.C. § 103(a) as being obvious. Claim 67 was further rejected under 35 U.S.C. § 112, second paragraph, for lacking antecedent basis.

Substance of Interview

A personal interview was held on October 3, 2006. Applicants thank Examiner Chambers for his time and consideration of the discussion. During the interview, proposed amendments to claims 66, 67 and 90 and proposed new claims 91 and 104 were discussed. Specifically, Applicants' representative provided support in the specification for the claims and explained why the claims overcome the prior art rejections. Examiner Chambers agreed that the amended claims and proposed new claims as discussed would overcome the prior art rejections. Additionally, Examiner Chambers was persuaded that there is sufficient support in the specification for the claims, but urged that Applicants reiterate the discussion in a written record. Examiner Chambers agreed that a proposed amendment to the drawings to include a "bleed resistor" would be acceptable to overcome the Examiner's objection to the drawings.

Response to Office Action

As discussed in the interview, in this response Applicants endeavor to explain where in the specification adequate and enabling support is provided for each of the recited claims. Additionally, Applicants will provide distinctions between the pending claims and the cited references.

1. Objections to the Drawings

The Office Action objected to the drawings as failing to show with particularly two features recited in the claims. Each objection will be addressed in turn.

As a first matter, the Office Action objects to Figure 3 as being inconsistent with claims 66 and 90. Before the amendment, these claims recited that "the logic device ... stores activation energy." As noted in the Office Action, however, the Energy Reserve Capacitor (ERC) depicted in Figure 3 is located outside the logic device.

In this Response, Applicants amend claims 66 and 90 to recite that the pyrotechnic devices are structured to store activation energy. Newly added independent claims 91 and 104 similarly recite that the pyrotechnic device stores activation energy. As can be seen in Figure 3, pyrotechnic device 202 includes capacitor 302 for storing activation energy. The specification at page 8, lines 4-9, provides:

> The ERC 302 is preferably included within the electronic assembly 308. However, the ERC 302 may be located elsewhere in the pyrotechnic device 202 if desired. By way of example and not limitation, the ERC 302 may be located adjacent to the electronic assembly 308, or within the logic device 300. Further, more than one energy reserve capacitor 302 may be provided within the electronic assembly 308 or within a single pyrotechnic device 202. Upon receipt of an arming command, the ERC 302 begins to charge, using power from the cable network 204.

Accordingly, in compliance with 37 CFR 1.83(a), Figure 3 illustrates that pyrotechnic device 202 includes a capacitor 302, which begins to charge to store activation energy upon receiving a digital arming command.

The Office Action additionally objects to the drawings for failing to illustrate "means by which the logic device discharges stored activation energy." Claim 90 recites that the pyrotechnic devices are structured to discharge the stored activation energy if a digital disarming command includes the unique identifier of the logic device. Newly added claim 104 similarly recites discharging activation energy in response to a digital disarming command.

Figure 4 illustrates the "means by which the logic device discharges stored activation energy." As illustrated in the figure, if the pyrotechnic device should disarm (406), then the bus controller (206 in Figure 2) issues a disarm command (408). This is further described in the specification on page 17, line 17 – page 18, line 16.

The original specification discloses that a "disarm command causes each selected pyrotechnic device 202 to discharge its ERC 302" into a "bleed resistor" or another "switched discharge device." (Page 18, lines 2-5.) The specification continues that "[t]he use of a bleed resistor or other switched discharge device to dissipate energy stored within a capacitor is well known to those skilled in the art."

The Examiner's October 4th follow-up letter notes that circuit diagrams are typically provided to show how electrical components achieve a desired function. In this case, a

circuit schematic is not required. As the Examiner notes, "boxes" can be used in connection with elements known to be conventional in the art.

The claims at issue are not directed to any particular arrangement of a capacitor and a resistor – in fact, the term "resistor" is not recited in any pending claim. Merely reciting that the pyrotechnic device discharges stored activation energy does not require Applicants to include a detailed circuit schematic detailing the arrangement of a capacitor and a resistor (or other discharge device).

To allay any possible concerns, in this Response Figure 3 has been amended to illustrate a bleed resistor (now numbered 314) in electrical communication with capacitor 302. The specification has been amended only to associate this element number with the existing description of a bleed resistor.

It is respectfully requested that by this explanation, coupled with the amendment to Figure 3, Applicants have overcome the Examiner's objection.

2. Objection to the Specification/Claim Rejections under 35 U.S.C. 112, 1st and 2nd paragraph

The Office Action additionally objects to the specification as failing to clearly explain the distinction between the "analog condition" and the "firing condition." In the follow-up letter of October 4th, Applicants were requested to refer to the specification to identify what is meant by these terms. The follow-up letter additionally requests explanation of how an analog condition is altered, and what the condition "looks like" before/after alteration. Each of these issues is addressed in turn.

a. Analog Condition

The "analog condition" of the network refers to a characteristic of the electrical power transmitted across the cable network, or bus. (See page 19, lines 5-7.) The use of

the word "analog" distinguishes this condition from digital signaling transmitted on the bus to communicate control signals.

The first few pages of the Detailed Description section provide useful context for understanding the analog condition. Referring to Figure 2, pages 4-5 of the specification disclose an embodiment of a networked electronic ordnance system in which a number of pyrotechnic devices 202 are interconnected by a cable network 204, or bus, which provides (i) low voltage and low current power and (ii) control signals to the pyrotechnic devices. (See in particular page 5, lines 2-4.) The specification continues that "[e]lectric power transmission and signal transmission preferably both occur over the same cable in the cable network 204, thereby eliminating any need to provide separate power and signal cables." (Page 5, lines 6-8.) The specification continues that "[t]he cable network 204 preferably carries both digital signals and power to and from the bus controller 206." (Page 5, lines 16-18.) As described on page 18, one important use of the analog power signal transmitted on the bus is to charge an energy reserve capacitor ERC 302 in a pyrotechnic device that receives an arming command. (Page 18, lines 9-10.)

Page 19 of the specification discloses that the voltage, modulation depth, or frequency of the electrical power signal that is being transmitted on the cable network 204 are characteristics of the signal that can be "sensed" by the bus interface 312 in a pyrotechnic device. (Page 19, lines 5-11.) Any of these characteristics can be considered an "analog condition" of the power signal.

The specification additionally provides that the bus controller 206 or other devices electrically connected to the pyrotechnic system 200 may be used to alter the analog condition of the cable network 204. (Page 19, lines 2-4.) Referring to lines 5-11, "altering" the condition can mean changing the voltage, modulation depth, or frequency of the transmitted electrical power signal. The bus interface (or some other component of the pyrotechnic device) can sense the analog condition, and thus, sense the change.

b. Firing Condition

The specification describes that the analog condition can modified so as to indicate a firing condition. The electrical power signal is in the firing condition once the analog condition has been altered. "Preferably, the bus controller 306 alters the analog condition of the cable network 204 to a firing condition." (Page 19, lines 2-3.)

The specification explains when the analog condition is modified. As disclosed, this occurs "at or shortly before transmitting a firing signal to one or more armed pyrotechnic devices 202." (Page 18, line 22 – page 19, line 1.) This is done as a safety measure, because the pyrotechnic device is configured to require that "both digital and analog fire control conditions must be met before a pyrotechnic device can be fired." (*Id.*, lines 20-21.) "It must receive a digital firing command and sense proper analog conditions on the cable network 204." (*Id.*, lines 18-20.)

Accordingly, the logic device 300 operates the initiator 304 "[i]f the bus interface 312 senses the analog condition corresponding to the firing command." (Page 20, lines 10-11.) In other words, if the analog condition of electrical power signal has not yet been altered to be in the firing condition, then the analog condition does not correspond to the firing command, and so the device cannot fire.

c. Claims 66 and 90

Claims 66 and 90 recite that the bus controller is structured to "alter an analog condition of the network to a firing condition." For the reasons provided above, this is adequately described in the specification. Simply stated, if an analog condition of the network is a characteristic of the electrical power signal, such as voltage, frequency, or modulation depth, then altering the analog condition means altering the voltage, frequency or modulation to alter that characteristic of the power signal. The specification explains that the bus controller preferably alters the analog condition and the bus interface in the pyrotechnic device senses the analog condition. (Page 18, lines 1-11.)

The specification additionally discloses that "when a particular logic device 300 receives the firing signal, it communicates with the bus interface 312 to determine whether the bus interface 312 senses the analog condition corresponding to the firing command." (Page 20, lines 2-5.) In other words, the logic device queries the bus interface to determine whether the analog condition was modified to be in a firing condition. If the firing command is received in the logic device, and "if the bus interface 312 senses the analog condition corresponding to the firing command, preferably the logic device 300 then operates the initiator 304." (Page 20, lines 10-11.)

Figure 4, element 412 illustrates that the analog bus condition is altered after the bus controller arms the pyrotechnic device (in step 404). After step 412, the already armed pyrotechnic device receives a fire signal in step 414, and the initiator fires.

Merely claiming that an analog condition must be "altered" before the initiator fires does not necessitate an illustration of what the analog condition might "look like." In light of the description in the specification and the illustration in Figure 4, Applicants request that the 112, first paragraph rejection of the claims be withdrawn.

d. Claim 67

Claim 67 has been rejected under 35 U.S.C. § 112, second paragraph, for lacking antecedent basis. In this Response, claim 67 has been amended to replace "the means for altering" with "wherein the analog condition of the network can be altered by altering ...." As discussed and agreed upon during the interview, this amendment overcomes the 112, second paragraph rejection.

3. Prior Art Rejections

During the interview, Applicant and Examiner discussed at length the distinctions between the cited references and the proposed amended and added claims. In response to the Examiner's follow-up letter, a summary of these distinctions is provided below.

Claim 66 recites that the bus controller is structured to "first transmit a digital arming command onto the network ..., thereafter alter an analog condition to a firing condition, and thereafter transmit a digital firing command onto the network." This is not disclosed in Boucher. Instead, Boucher describes that "communication signals are carried at a first voltage and arming signals are provided at a second, higher voltage." (Col. 5, line 66 to col. 6, line 2.) The claim recites that the analog condition is altered after a digital arming signal is transmitted. In contrast, Boucher merely teaches transmitting a high voltage arming signal.

As discussed during the interview, this distinction between Boucher and the language in claim 66 is significant. Regarding claim 66, after the pyrotechnic device is armed, safety is enhanced by requiring two events before firing: altering the analog condition to a firing condition and receiving a firing command. Such a safety feature is not accomplished in Boucher's system, however. Boucher instead attempts to improve safety by making the arming signal itself less mistakable.

Claim 90 recites that the pyrotechnic device is structured to discharge activation energy if a digital disarming command is received that includes the unique identifier of the logic device. This also is not disclosed in Boucher. Instead, referring to Figure 3, Boucher discloses the use of a "momentary switch" that incrementally charges a capacitor while a bleed resistor continually drains the current. (Boucher at col. 14, lines 28-65.) As Boucher states,

> Accordingly, in order to fully charge firing capacitor 26, a series of arming intervals during which arming switch 28 is closed must occur with sufficient duration and frequency to overcome the dissipative function of bleed resistor 32.

(*Id.*, lines 48-51.) Boucher does not disclose discharging stored activation energy in response to a digital disarming command with a unique identifier for the logic device in a pyrotechnic device. New independent claim 104 also recites this limitation.

New independent claim 91 recites that, *once armed*, the pyrotechnic device releases stored activation energy into its initiator once both (1) the bus interface senses that the analog condition of the network has been modified to the firing condition and (2) the logic device detects that a digital firing command is received that includes the unique identifier of its logic device. As described above, Boucher does not teach a system in which the analog condition of the network is modified *after the device is armed*. In fact, Boucher does not disclose altering an analog condition of the network at all. Further, Boucher does not disclose sensing that the analog condition has been modified in the bus interface.

Lastly, the final Office Action additionally rejected claims 66, 67 and 70 as being obvious over Boucher in view of Applicants' own disclosure or U.S. Patent No. 5,460,093 to Prinz. Applicant's representative and Examiner discussed this during the Interview and appeared to reach agreement that this rejection should be withdrawn.

With regard to Applicants' own disclosure, as provided on page 9, lines 13-16, the logic device 300 is "preferably an application-specific integrated circuit (ASIC) ... [or] any other appropriate logic device 300, such as but not limited to a microprocessor, a field-programmable gate array (FPGA), discrete logic, or a combination thereof." By stating that the logic device is known to those skilled in the art, Applicants were referring to designing the structure of a logic device (such as an ASIC or FPGA) for use in a networked environment. Clearly, Applicants were not admitting that it was known to use a logic device in a manner where both digital and analog fire control conditions must be met before a pyrotechnic device can be fired.

Finally, the Prinz reference is directed to a programmable electronic time delay initiator that, at the end of a programmed time delay, gates a pre-stored charge on a capacitor to fire an explosive. Prinz does not disclose altering an analog condition of a network before an initiator can be fired. Prinz also does not disclose using a digital

disarming command to discharge stored activation energy. Accordingly, combining Prinz with Boucher still does not teach any of claims 66, 90, 91 or 104.

Applicants submit that independent claims 66, 90, 91 and 104 are now in condition for allowance, and that newly added dependent claims 92-103 and 105-109 are also patentable based at least upon their dependency from patentable independent claims. Accordingly, Applicants respectfully request that the rejections and objections in the Final Office Action be withdrawn.

If Applicants' representative can be of assistance in furthering the prosecution of this case, the Examiner is encouraged to contact the undersigned at any time, at (202) 434-1607.

Respectfully submitted,
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